pendulum experiments pure and simple, we have memoirs by De la Condamine, Borda and Cassini, Prony, Kater, Bessel, Sabine, and Baily, and in addition to these we have Stokes's paper on the effects of fluid friction on the motion of pendulums.

We must, in conclusion, express our gratitude to La Société Française de Physique for the publication of these volumes, and to MM. Potier, Joubert, and Wolf, for the masterly way in which they have edited them. We hope that the volumes before us are but the first terms in an infinite series. J. J. THOMSON.

THE FORMATION OF BEACHES.

Sul Regime delle Spiaggie, e sulla Regolazione dei Porti. ("On the Formation of Beaches, and the Rules for designing Harbour Works.") By Signor P. Cornaglia, late Inspector of the Royal Corps of Italian Civil Engineers. (Turin: R^a Tipografia Paravia, 1891.)

THE laws that govern the movements of sand along the sea-shores, the formation and corrosion of beaches, the shifting of bars and sand-banks at the mouth of rivers, and the silting up of harbours, have not yet been clearly explained, as the problem is a complex one. These effects result from a combination of various causes, such as the action of sea-waves, of tidal currents, of the natural discharge of rivers, and of the dimensions and specific gravity of the materials that form the beaches and give them a special angle of rest.

To examine this problem, Signor Cornaglia takes it up in its most simple form. He tries to ascertain the laws that regulate the propagation and effects of sea-waves acting in a tideless sea, or nearly so, as is the Mediterranean. These researches are made both theoretically and practically, by the help of mathematical analysis and by verifying the results of theory by direct observations of waves in accumulating the materials that form the beaches. These form the subject of two memoirs, in which are discussed the vertical propagation of waves in liquids, and the origin and action of bottom-waves (*flutti di fondo*) in liquids in a state of undulation.

The results of these researches are thus expressed:—(*a*) The undulatory movement of liquids generates near the bottom an oscillatory movement called *bottom-wave*, or under wave (*flutto di fondo*), which is alternately directed to or from the shore; (*b*) vertically under the crest of a superficial wave, the bottom-wave is directed toward the shore; under the hollow of a wave it is directed toward the sea; (*c*) the force of these bottom-waves increases with the force of the superficial waves, with the greater distance or "*fetch*" from which the waves arrive, and with the greater depth of the sea; (*d*) the energy of these bottom-waves may be great at great depths; (*e*) on a rising submarine slope the force of the bottom-waves directed toward the shore is greater than that of the reverse bottom-waves; (*f*) the bodies resting upon the bottom of the sea and exposed to these bottom-waves are struck in alternate directions; (*g*) the component of the weight of these bodies, parallel to the bottom slope, may counterbalance the effects of the direct bottom-waves, or, added to the effect of the return bottom-waves, these latter may prevail upon the direct ones; (*h*) the line along which the action of each of the two opposite bottom-waves, combined with the component of the weight of the bodies, counterbalances that of the other, is called the *neutral line*; (*i*) all conditions being equal, this *neutral line* is situated at a greater depth the stronger the waves are, and the smaller the slope of the bottom and the size and specific weight of the bodies resting upon the bottom; (*j*) in the Mediterranean this *neutral line* is situated at depths varying from 8 to 10 metres, or 27 to 33 feet; (*k*) on the land side of the neutral line the materials forming the bottom of the sea are pushed by the bottom-waves toward the shore, on the sea side they are drawn toward the greater depths; (*l*) parallel to the shore the materials travel always in a contrary direction to that from which the waves come, and they travel alternately in one way or the other according to the direction of the waves. However, the ultimate direction in which these materials move is that corresponding to the prevailing waves, which is also, more or less, that of the prevailing winds.

In a third memoir the author discusses the formation or corrosion of beaches in a tideless sea, and explains a long series of observations and experiments made principally by himself along the shores of the Riviera, with a view of ascertaining the position of the neutral line.

In a fourth memoir are examined the conditions of the estuary of a river opening into a tideless sea, and the effects due solely to the waves having been previously ascertained, the effects due to the outgoing water of the river are described. Then the author passes on to examine the case of a river opening into a sea subject to the influence of tide and tidal currents; and by separating the effects of the waves and of the outgoing water of the river proper, he tries to explain the effects due exclusively to the action of tides. From this he gives some hints about the probable position of the neutral line resulting from all these different causes, and by comparing the conditions of the Mersey with those of the Thames and other tidal rivers, the author concludes that in the former case the outlet of the river is on the land side of the neutral line, and thus the materials brought down by the river or washed away from the coast are pushed into the estuary, while in the case of the Thames its outlet is on the sea side of the corresponding neutral line, and the materials are drawn into deeper water. In the same way he explains why some harbours in the Mediterranean having their entrance in depths of water superior to 10 metres, and thus outside the neutral line, have kept good for centuries, while other harbours with their entrance inside the neutral line have gradually silted up.

Having thus explained his views on the formation of beaches, Signor Cornaglia makes use of them in laying down in several memoirs the principal rules for designing such maritime works as may be necessary to maintain or improve the navigable channel in the estuary of a river, or to protect the entrance of a harbour, or to prevent the sea from encroaching upon a beach. There are descriptions of works carried out in several Italian harbours during this century, and the results, good or bad, according to the way these works were designed.

A drawback to this book is that it is written in the form of separate memoirs, so that there are many repetitions and some unnecessary details, which rather diminish than

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add to the clearness of the work. Taken as a whole, however, the book will be read with interest and advantage both by the maritime engineer and by the geologist.

EGYPTIAN HISTORY.

Egypt under the Pharaohs. By H. Brugsch-Bey. A New Edition, condensed and thoroughly revised by M. Brodrick. (London: John Murray, 1891.)

THE science of Egyptology is scarcely seventy-five years old, and published formulated statements of the history of Egypt derived from the comparatively newly-acquired decipherment of hieroglyphics are not yet thirty years old; books on Egyptian history are now so common that the general reader has yet difficulty in deciding which of those available is best for him to read or study. Dr. Birch's "Egypt from the Earliest Times to B.C. 300" printed, we believe, in 1875, is without doubt, the best of all the small histories of Egypt which have ever been written: the facts are to be depended upon, few alterations are necessary, difficulties are not slurred over, and the whole subject is there treated with the breadth of view and learning only to be found in such a scholar. More concise, but written in the same admirable style, is the "Aperçu" of Mariette, which aimed at presenting in a small compass the principal facts of Egyptian history to the visitors to the Exhibition in Paris in 1867; for the general history of Egypt and the relations of her people with foreign nations in the various epochs of her national life, the reader would naturally consult Maspero's "Histoire Ancienne des Peuples de L'Orient," and Lenormant's "Histoire Ancienne de l'Orient." The best examples of scientific histories of Egypt are those of Dümichen and Wiedemann. In the "Aegyptische Geschichte" of the latter scholar, published at Gotha in 1884, the author not only sets before the general reader or student the statements of certain facts, but gives in foot-notes the authorities for the statements, so that his work may easily be controlled.

This was an important step in advance, and has done more to convince people generally that the decipherment of the Egyptian inscriptions has been productive of important results than can be directly estimated. Long, however, before any of the above-mentioned works was written, or probably planned, Dr. Brugsch, the greatest of all living Egyptologists, so far back as 1859, published the first part of a history of Egypt which was to begin with the earliest monument, and to end with our own days; this part was entitled "L'Egypte sous les Rois Indigènes," and was published with 19 plates in quarto, but the two other parts, which were announced to contain the history of Egypt under the Greeks and Romans, and under the Arabs, seem never to have appeared. In 1876 Dr. Brugsch published his "Geschichte Aegyptens unter den Pharaonen," in two volumes, with maps and tables; and in this work he dealt with the history of Egypt as comprised in the thirty dynasties, beginning with the first historical king, Menes, and ending with Nectanebus. The narrative was written in fine German, and nearly every important event in the history of Egypt, as then known, he described by translating the hieroglyphic inscription which referred to it. These translations read easily, and, on the whole, represented very well the sense of the Egyptian inscriptions in the words of a modern language. In 1877 Mr. John Murray published an English translation of this work entitled "A History of Egypt under the Pharaohs," with Maps, by H. Brugsch; the translation was the joint work of Danby Seymour and Philip Smith, and although it was on the whole good, it was only too evident that on certain points of Egyptology the translators had no special knowledge, while the beauty of Dr. Brugsch's style was, of course, lost in the process of translation. In 1881, Mr. Murray issued a second edition of the work, which, in addition to a new preface by Dr. Brugsch, contained a number of notes by Philip Smith, which were helpful to the reader, and several alterations and corrections by the author himself; the thirty-two pages of additions and notes were also most useful. During the past ten years great strides have been made in the science of Egyptology, notwithstanding the loss, by death, of Birch and Lepsius, the fathers of Egyptology; and general investigations into the history and language of Egypt have resulted in the discovery of a host of new facts, many of which have an important bearing upon the received ideas on these subjects. That a new edition of Brugsch's "Aegypten," or of its English translation is called for, is not to be wondered at, and no one has shown himself more sensible of this need than Mr. Murray himself. We venture to submit, however, that any attempt to "condense" or "thoroughly revise" the work by anyone except Dr. Brugsch or some competent hand was a mistake. The "condensed" edition of "Egypt under the Pharaohs" now before us contains 450 pages of text 8vo., and three maps; all Philip Smith's notes, which, as we before said, were useful to the general reader for whom this book is intended, are deleted, Brugsch's article on the Exodus, the additions and notes, the transliteration and translation of the stele of Usertsen III. have been omitted, and the originally full index has been cut down. Each page contains five lines more than the second English edition, hence we necessarily expect the "condensed" edition by Miss Brodrick to be a smaller book; but seeing also that by cutting out clauses and important adjectives, &c., &c., she has succeeded in putting 49 pages of the second English edition into 18 of the condensed edition, we do not understand the statement made in the second paragraph of her preface that nothing has been omitted except the Essay on the Exodus and the transliteration, &c., of the Tablet of Usertsen.

We have no doubt that Macaulay's "History of England" could be condensed to one-fifth of its present size by cutting out all that is explanatory of facts; but what should we gain by this mutilation? Miss Brodrick's condensation has been so vigorous that Brugsch's explanation of the word "Hyksos," which occupies fifty-seven lines in the second English edition, occupies only eight in hers; and where Brugsch gives two references to one event described in the Bible, Miss Brodrick omits the one which refers to the fuller narrative (p. 375, note 4). "The much-vexed question of the nationality of the Bubastites has, so far as possible, been accommodated to Brugsch-Bey's present views" by omitting whole paragraphs which occur in the second English edition.

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